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FINAL

ENGINEERING EVALUATION/COST ANALYSIS WORK PLAN FOR THE AVERY LANDING SITE AVERY, IDAHO

REVISION 0

Submitted to:

Potlatch Land and Lumber, LLC

Submitted by:

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ACRONYM AND ABBREVIATION LIST

amsl	above mean sea level
AOC	Administrative Order on Consent
ARAR	applicable, relevant, or appropriate requirements
BA	Biological Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfs	cubic feet per second
COPCs	constituents of potential concern
CWA	Clean Water Act
CRP	Community Relations Plan
EE/CA	engineering evaluation/cost analysis
E & E	Ecology and Environmental
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
FWS	U.S. Fish and Wildlife Service
SAP	Field Sampling Analysis Plan
Golder	Golder Associates Inc.
Hart Crowser	Hart Crowser, Inc.
HASP	Health and Safety Plan
IDAPA	Idaho Administrative Procedure Act
IDEQ	Idaho Department of Environmental Quality
LNAPL	light non-aqueous phase liquids
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
Milwaukee Railroad	Chicago, Milwaukee, St. Paul and Pacific Railroad Company
µg/L	microgram/liter
PAHs	polynucleated aromatic hydrocarbons
Potlatch	Potlatch Land and Lumber, LLC and Potlatch Corporation
PCBs	polychlorinated biphenyls
PPP	Public Plan
QAPP	Quality Assurance Project Plan
OPA	Oil Pollution Act
RAO	removal action objectives
SHPO	State Historic Preservation Office
ROW	right-of-way
Site	Avery Landing Site, Avery Idaho
VOC	volatile organic compounds
Work Plan	Engineering Evaluation/Cost Analysis Work Plan for the Avery Site

1.0 INTRODUCTION

This engineering evaluation/cost analysis (EE/CA) work plan (Work Plan) has been developed by Golder Associates Inc. (Golder) for Potlatch Land and Lumber, LLC and Potlatch Corporation (collectively referred to as Potlatch) pursuant to the Administrative Order on Consent (AOC) No 10-2008-0135. Potlatch entered into the AOC with the U.S. Environmental Protection Agency (EPA) to complete an EE/CA for the Avery Landing Site (Site). The Site is located along State Highway 50 about 0.75 mile west of the town of Avery, Idaho (Figures 1-1 and 1-2). The Site boundary is shown on Figure 1-3 and extends along the St. Joe River about 0.5 miles. This EE/CA will provide sufficient information on the source, nature, and extent of contamination, any human health and ecological risks presented by the Site, and recommend removal action alternatives appropriate for addressing the removal action objectives.

1.1 Statement of Purpose

The purpose of this Work Plan is to describe how Potlatch will assess the human health and environmental impacts associated with the releases of hazardous substances and petroleum hydrocarbons from discharges at the Site in order to recommend removal action alternatives under the auspices of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. § 9601 *et seq* and under Section 311 of the Clean Water Act (CWA), 33 U.S.C. § 1321, as amended by the Oil Pollution Act (OPA) of 1990, 33 U.S.C. § 2701 *et seq*. This EE/CA is being performed by Potlatch as a CERCLA Non-Time-Critical Removal Action with oversight by the EPA. The AOC contains the scope of work that is required for completing the EE/CA. The EE/CA will be conducted in conformance with *Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA* (OSWER Directive 9360.0-32). This document presents the investigations and evaluations that will be conducted to complete the EE/CA and satisfy the AOC.

1.2 Statement of EE/CA Objectives

The goal of this EE/CA is to assess the nature and extent of the contamination at the Site and to evaluate a limited number of removal action alternatives appropriate for addressing the contamination. Contamination at the site that has impacted soil, groundwater, and surface water will be adequately understood so that removal action decisions can be made. The EE/CA will provide sufficient information on the source, nature, and extent of contamination, and human health and ecological risks presented by the Site.

- The EE/CA development process includes the following components: Site characterization
- An evaluation of the current and potential for adverse affects to human health and the environment occurring as a result of exposure to contaminants associated with the Site
- Identification of removal action objectives
- Identification and analysis of removal action alternatives
- Comparative analysis of removal action alternatives
- Recommended removal action alternative

Once sufficient understanding of the nature and extent of Site impacts and risks have been obtained, the EE/CA Report will focus on the evaluation of applicable removal actions. The EE/CA removal action evaluation will support the recommendation of a Non-Time Critical Removal Action that meets CERCLA requirements.

1.3 Work Plan Organization

This EE/CA Work Plan has been structured to facilitate a clear understanding of all the elements to be conducted. The Work Plan is organized as follows:

- **Section 1 – Introduction:** This section briefly states the purpose and objectives of the Avery Landing EE/CA, and outlines the general approach for conducting the EE/CA.
- **Section 2 – Background Summary and Site History:** This section describes the Site history including; legal description, address, property lines, property history, and review of previous environmental investigations.
- **Section 3 – Physical Setting:** This section is an overview of the Site topography, local and regional geology, hydrogeology, ecology, area meteorology, and demographics.
- **Section 4 – Site Conceptual Model and EE/CA Approach:** This section identifies potential contaminants of concern and potential pathways and receptors at the Site. The rational for the EE/CA approach is also presented.
- **Section 5 – EE/CA Scope of Work:** This section identifies the scope of work and tasks that will be completed under the EE/CA.
- **Section 6 – EE/CA Study Reporting:** This section identifies the components of the EE/CA Report and presents the information that will be contained in the report.
- **Section 7 – Schedule:** This section presents the general schedule that will be implemented for the EE/CA. Review time for draft reports and plans by EPA are estimated.
- **Section 8 – Bibliography:** This section includes citations for the references used and documents reviewed to prepare this work plan.
- **Attachment A – Treatability Study Work Plan (to be completed):** This attachment defines the necessary treatability studies for applicable remedial technologies for effectiveness evaluation and cost estimating.
- **Attachment B – Sampling and Analysis Project Plan (to be completed):** This attachment identifies the sampling locations and describes the methods and procedures that will be used to conduct the EE/CA investigations. This attachment will contain a Quality Assurance Project Plan (QAPP) that identifies the field and laboratory quality control procedures and decontamination and chain of custody procedures. The QAPP will be prepared in accordance with "EPA Requirements for Quality Assurance Project Plans (QA/R-5)" (EPA/240/B-01/003). The QAPP can be modified to include provisions to meet other EPA quality requirements that are needed.
- **Attachment C – Health and Safety Plan (HASP) (to be completed):** This attachment identifies the project tasks, contaminants and hazards, and the safety procedures for addressing hazards. Procedures for addressing potential emergencies associated with the project are also discussed.

- **Attachment D – Biological Assessment Work Plan (to be completed):** This attachment defines the information and data needed to prepare a Biological Assessment specific to endangered and threatened species for the selected removal action at the Site. The Biological Assessment Work Plan will be consistent with the U.S. Fish and Wildlife Service and National Marine Fisheries Service *998 Final ESA Consultation Handbook: Procedures for Conducting Section 7 Consultations and Conferences*.
- **Attachment E – Cultural Resources Work Plan (to be completed):** This attachment defines the scope of work and report required to assess cultural resources at the Site. The Cultural Resources Work Plan will be consistent with the Idaho State Historic Preservation Office (SHPO) and Archaeological Survey of Idaho *Guidelines for Documenting Archaeological and Historical Surveys* requirements. The Cultural Resources Work Plan will include coordination with the Coeur d' Alene Tribe Historic Preservation Office.

The Community Relations Plan (CRP) for this EE/CA will be developed and administered by EPA. The CRP identifies the process for informing the public about the EE/CA process and soliciting public input. Public involvement in the EE/CA process will be important to guide decisions regarding the removal actions and long-term land uses for the Site. The CRP identifies the methods for providing public notice, seeking and incorporating public concerns, and incorporating public meetings into the EE/CA process.

2.0 SITE BACKGROUND SUMMARY

The following sections describe the Site location, surrounding area, and the history of operations at the Site.

2.1 Site Location

The Site is located in the St. Joe River Valley in the Bitterroot Mountains in northern Idaho. Figures 1-1, 1-2, and 1-3 show the location and boundary of the Site. The Site is on filled and flattened land bordering the St Joe River about 0.75 miles west of the town of Avery in Shoshone County, Idaho. The Site encompasses approximately 10 acres. The Site is within the NW quarter of Section 15, Township 45 North, Range 5 East and the NE quarter section of Section 16, Township 45 North, Range 5 East, Willamette Meridian. The approximate latitude is 47° 13' 57'' North and longitude is 115° 43' 40'' West.

2.2 Site History

2.2.1 Ownership History

Currently, the Site is principally owned by four parties: The eastern half (herein referred to as Section 15 Area) is owned by the Bentciks; the western half (herein referred to as Section 16 Area) is owned by Potlatch; the northern portion of both Section 15 and Section 16 properties is owned by the Federal Highway Administration or the U.S. Forest Service that includes State Highway 50 and its easement (herein referred to as Highway 50 Property). The boundary between Sections 16 and 15 of T45N R5E separates the Bentcik and Potlatch properties. The Federal Highway Administration granted a right-of-way (ROW) to Shoshone County to operate and maintain Highway 50. The State of Idaho also owns the stream bed and banks of the St. Joe River up to the ordinary high water mark as well as the groundwater underlying the entire Site. Figure 2-1 identifies the division between Sections 15 and 16 and existing Site structures. Figure 2-2 presents the surveyed property boundaries and Highway 50 Property.

2.2.2 Operational History

2.2.2.1 Site Uses

The Site was used as a Chicago Milwaukee St Paul Railroad (herein referred to as Milwaukee Railroad) maintenance and fueling station from 1907 to 1977. The railroad spurs were removed roughly in the period between 1977 and 1986. Several residents live on the Site year-round, and several more reside on the property seasonally. Access to the Site is unrestricted. The immediate area around the Site is residential and recreational. The St. Joe River is adjacent to the Site.

2.2.2.2 Railroad Operations at the Site

Railroad operations at the Site within Section 16 of T45N R5E included the following:

- Railroad switchyard with train roundhouse
- Engine houses and engine repairs and maintenance
- Minor railroad maintenance and machine shop
- Potential storage of electric transformers

Railroad operations at the Site within Section 15 of T45N R5E included the following:

- Fuel oil unloading, storage, and train fueling depot
- Potential storage of electric transformers
- Potential minor railroad maintenance

2.2.2.3 Potlatch Ownership at the Site

After Potlatch acquired ownership of a portion of the Site in 1980, the western portion of the Site in Section 16 was utilized by Potlatch as a log landing and log storage area in the 1980s. Also portions of Section 16 were leased to third parties for a variety of uses such as log storage, material storage, parking, cabin sites and trailer sites. A number of the cabin site and trailer site leases are still in effect. A septic system serves these cabins and trailer sites (a total of 17 potential hookups). In the 1985-1986 Potlatch removed rail lines in Sections 15 and 16 and a 500,000 gallon above ground diesel storage tank in Section 15 on land either owned by the United States at the time or acquired by the United States in a condemnation proceeding. The residual fuel oil left in the 500,000 gallon storage tanks was removed, captured and burned off-site. No documented releases or disposal of hazardous substances or petroleum products occurred at the Site during the tank and rail line spur removals. Potlatch is also unaware of any releases or on-site disposal of hazardous substances or petroleum products since obtaining ownership. When a petroleum-type sheen was observed in the St. Joe River adjacent to the Site in 1988, Potlatch investigated the contamination at the Site and undertook a variety of remedial measures under the supervision of IDEQ as more particularly described in this Work Plan.

2.2.3 Regulatory Actions/Issues and Observations

The following are Site regulatory actions and issues:

- The earliest documented release of petroleum product from the Site discharging to the St. Joe River was reported in June 1970.
- 1973 – 1974, EPA and IDEQ investigated petroleum releases at the Site and discharges to the St. Joe River. EPA issued Milwaukee Railroad a NPDES Permit in 1974 to discharge petroleum impacted wastewaters to the St. Joe River (NPDES Permit No. ID-000003-5).
- 1988, IDEQ identified a petroleum sheen in the St. Joe River.
- 1992-1993 EPA contractor, URS Consultants, conducted a Site Investigation to evaluate whether further action was required to address the contamination at the Site. The Site data showed the presence of organic and inorganic hazardous substances in Site media.
- In 1994, Potlatch and Idaho Department of Environmental Quality (IDEQ) signed a Consent Order (39-108) for remediation on Potlatch's Property. Remediation included a series of trenches into the groundwater table running parallel to river. Sumps connected to the trenches were used to remove captured LNAPL floating product.
- In March 2000, IDEQ issued a Consent Order Modification for Site Characterization, River-Bank Rehabilitation and an additional Corrective Action Plan.
- Summer – Fall 2000, near vertical impermeable wall constructed adjacent to the St. Joe River. The impermeable wall was designed to extend below the groundwater table and contain LNAPL floating product from discharging to the river. The contained LNAPL is removed via a series of sumps parallel and to the impermeable wall.

- Fall 2005, A small sheen on the St. Joe River adjacent to a portion of the Site was observed by Potlatch and reported to IDEQ (Potlatch, 2005).
- On January 5, 2007, the EPA served Potlatch with a Notice of Potential Liability for the Avery Landing Site under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and under Section 311 of the Clean Water Act (CWA), as amended by the Oil Pollution Act (OPA) of 1990.
- In July 2007, the EPA through their consultant Ecology and Environment, Inc. issued a Start-3 Report of the results of additional investigations at the Site conducted during the spring and summer of 2007.

2.3 Avery Landing Site Description

The Site was originally developed as a railroad roundhouse, maintenance, repair, and fueling depot. There is little remaining at the Site to indicate its previous use. Presently the Site is relatively flat ground with gravel and sparse vegetative growth. The ground is composed mainly of fill, presumably to create a larger flat area for the railroad operations.

There are primarily four properties located on the Site: Highway 50 Property; the Bentcik property includes the eastern half of the Site and contains a vacation cottage, but also contains numerous monitoring wells and piezometers for monitoring groundwater; the Potlatch property which has several man-made structures including a pump house, bath house, motor homes, and motor home utility hook-ups on its western portion and, the State of Idaho property consisting of the bed and banks of the St. Joe River. Several residents live on the Potlatch property year-round, and some reside on the property seasonally. A domestic groundwater supply well is in the western portion of the Potlatch property for use by the residents and visitors. The eastern portion of the Potlatch property is vacant with numerous monitoring wells and piezometers that are used for monitoring groundwater. Figure 2-1 shows the approximate boundary between the Bentcik and Potlatch properties and also shows Highway 50.

2.4 Description of Adjacent Properties

The Site is in the remote and narrow St. Joe River Valley. To the north, the St. Joe River Valley steeply rises into mountainous terrain and is used for recreation and wildlife habitat. The land immediately to the east and west of the Site does not contain homes or facilities, but is used primarily for recreation, riparian wildlife habit, and access to the St. Joe River.

The St Joe River borders the Site to the south and is a special resource river that is used for wildlife habitat, recreation, and as drinking water for downstream residents. According to the Idaho Administrative Procedures Act (IDAPA) (IDAPA 58.01.02.110.11), the segment of the St. Joe River adjacent to the Site has the following designations: special resource water, domestic water supply, primary contact recreation, cold water biota, and salmonid spawning. The St. Joe River has additional designations including, but not limited to, critical habitat for bull trout (Federal Register Volume 70, Number 185). The surface water quality requirements for the St Joe River are set forth in IDAPA 58.01.02 of the Idaho Administrative Code; "Water Quality Standards and Wastewater Treatment Requirements."

2.5 Previous Investigations

The Avery Landing Site has been under investigation since the late 1980s. A list of the most relevant investigation reports are as follows:

- Hart Crowser, October 27, 1989. *Site Exploration Report, Avery Landing Avery, Idaho*, prepared for Potlatch Corporation.
- Idaho Department of Environmental Quality (IDEQ), May 9, 1991. *Preliminary Assessment (PA) Avery Railroad Dump and Roundhouse, Avery. Idaho*, prepared for the U. S. Environmental Protection Agency, Region X, Superfund Program Management Section.
- URS Consultants, Inc. (URS), January 19, 1993. *Site Inspection Report for the Avery Railroad Dump and Roundhouse Site, CERCLIS ID No. IDD984666313*, prepared for the U.S. Environmental Protection Agency, Contract No. 68-W9-0054, Work Assignment No. 54-17-0JZZ, Seattle, Washington.
- Hart Crowser, November 22, 1993. *Report of Sampling and Analyses, Avery Landing*, prepared for Potlatch Corporation.
- Hart Crowser, December 2, 1993. *Proposed Draft Replacement for Free Phase Recovery Completion Section in the Draft Consent Order and Remediation Plan,* prepared for Potlatch Corporation.
- Hart Crowser, December 29, 1993. *Results of December 1993 Site Visit and Testing, Avery Landing*, prepared for Potlatch Corporation.
- Hart Crowser, July 27, 1994. *Draft Final Design of Free Product Recovery System (FPRS), Avery Landing, Idaho*, prepared for Potlatch Corporation.
- Hart Crowser, November, 1994. *Laboratory Results for Excavated Soils Avery Landing Recovery System*, prepared for Potlatch Corporation.
- Hart Crowser, 1996 through 1999. Quarterly Performance Reports, Avery Landing Recovery System, Avery, Idaho, prepared for Potlatch Corporation.
- Hart Crowser, August 7, 2000. *Corrective Action Plan, Avery Landing Site, Avery, Idaho*, prepared for Potlatch Corporation.
- Hart Crowser, August 4, 2000. *Site Characterization Report (SCR) and Second Quarter Performance Report – Avery Landing*, prepared for Potlatch Corporation.
- Hart Crowser, September 5, 2000. *Addendum No. 1 for Corrective Action Plan, Avery Landing, Avery, Idaho*, prepared for Potlatch Corporation.
- Hart Crowser, Inc. (Hart Crowser), December 15, 2000. *Remediation System Installation and Third Quarter 2000 Performance Report, Avery Landing Recover System*, prepared for Potlatch Corporation.
- Hart Crowser, Inc. (Hart Crowser), 2001 through 2004). Quarterly Performance Reports, Avery Landing Recover System, prepared for Potlatch Corporation.
- Potlatch Corporation, 2002 to 2005. Avery Landing Monitoring. Annual Groundwater Monitoring Reports. Potlatch Corporation-Resource Management Division. St Maries, Idaho.
- Farallon Consulting, L.L.C. (Farallon), March 17, 2006. *Failure Analysis and Preliminary Corrective Action Work Plan, Avery Landing Site, Avery, Idaho.*
- Ecology and Environment, Inc. (E & E), April 10, 2007. *Avery Landing Site; Site--Specific Sampling Plan*, prepared for the U.S. Environmental Protection Agency, Contract Number EP-S7-06-02, TDD 07-03-0004, Seattle, Washington.

- Ecology and Environment, Inc. (E & E), July 31, 2007. *Avery Landing Site; Removal Assessment Report*, prepared for the U.S. Environmental Protection Agency, Contract Number EP-S7-06-02, TDD 07-03-0004, Seattle, Washington.

2.6 Previous Removal Actions

2.6.1 1994 Floating Product Capture Trenches

Three separate trenches were installed to intercept groundwater having floating petroleum product called Light Non-Aqueous Phase Liquids (LNAPLs). The idea was to place the trenches below the water table along the downgradient boundary of the floating LNAPL. Groundwater was pumped using groundwater extraction pumps to induce and enhance local hydraulic gradients to carry floating LNAPL to the trenches where it could be removed by skimming-type pumps. The extracted groundwater was pumped through an oil water separator to remove any oil, afterward the water was discharged to an on-Site infiltration trench located just north of State Highway 50 between Sections 16 and 15 of T45N R5E. The removed oil from the trenches and recovered oil from the oil/water separator was sent off-Site for recovery and reuse. The groundwater pumping could be operated to induce river water toward the trenches and keep any floating LNAPL between the trenches and the river from discharging to the river. It is Golder's understanding that portions of the trenches became dry and failed to capture all floating LNAPLs, as witnessed by continued floating LNAPL discharges along river bank seeps. A total of 1290 gallons of oil was captured from the original remediation system that operated from 1994 to 2000. The oil was removed on August 9 and 10, 2001 for burning in the Potlatch's St. Maries Complex boilers.

2.6.2 2000 Impermeable Vertical Wall along River by Hart Crowser

This system was installed to prevent floating LNAPL from migrating to the river by a semi-vertical impermeable containment barrier (synthetic membrane) and remove the floating product from capture wells located on the upgradient side of the barrier. The recovery of oil using the new system is unknown, but it is likely minimal as down hole absorbent pads have only been used sporadically.

Groundwater was allowed to flow underneath the vertical barrier to the river. The system appears to have worked for a number of years until seeps containing LNAPL oil were observed during river low flows in the fall of 2005 (Potlatch, 2005). Since the fall of 2005 when floating product seeps are observed during river low flows, oil absorbent booms are placed in the river around the seeps. The booms are maintained monthly until river ice develops and the booms cannot be properly maintained. The source of the product seeps could not be from residual petroleum along river bank soils, because all impacted soils along the river bank was removed and replaced with clean soils.

It is suspected that the floating product is migrating under the containment barrier at low river stages. The installation of the vertical barrier was difficult because groundwater water and river water levels were not able to significantly be lowered within the cofferdam system and the presence of large boulders and a concrete abutment restricted the installation of the barrier. Because of these installation problems, the depth of the barrier may not extend below the lowest river level in all locations along the river bank. Such a situation would allow the floating LNAPL to migrate under the barrier at low river levels that influence the groundwater levels within the river bank.

It is also possible that tears or seam opening have compromised the barrier. If tears were a major cause for floating LNAPL seepage, the seeps containing LNAPL would be expected to be localized: this is consistent with periodic observations on the site.

A final possibility is that the floating product is migrating around the ends of the barrier. If this were the case the location of the floating product seeps to the river would be expected to occur near the ends of the containment barrier. This is not consistent with periodic observations on the site.

Because seeps containing floating LNAPL have been observed to occur after the removal actions were completed in 2000, oil absorbent booms (sausage-shaped) have been placed around the LNAPL discharging seeps, when observed, to minimize further impacts to the St. Joe River. LNAPL seeps are typically observed during low water conditions starting in late summer. When the booms are in place, typically between September and December, the booms are inspected and maintained between two and three times every month. When the St. Joe River rises significantly due to late fall precipitation or snowmelt, or ice begins to form on the river, the booms are removed. In 2008, the booms were maintained between March and December.

3.0 PHYSICAL SETTING

3.1 Topography and Area Features

The Site is relatively flat with an embankment of about 15 feet along the St. Joe River. The elevation of the Site is 2,450 feet above mean sea level (amsl). The topography of the local area around the Site is mountainous and rises to over 4,000 feet amsl.

3.2 St Joe River Hydrograph

The St. Joe River flows from the east to west along the Site's southern boundary. The river flows during May from snow melt average between 7,000 and 8,000 cubic feet per second (cfs), while during September the average river flows are between 400 and 500 cfs. Sudden storms, especially heavy rain on snow, can cause extreme river flows and flooding during warm periods in winter and spring. River flows have been measured from 30,000 to 50,000 cfs at Calder, Idaho (USGS, National River Data Base, 2008).

3.3 Climate

The climate at the Avery Landing Site is influenced by the mountainous terrain. The major weather fronts are from the Pacific Ocean and from the Canadian Arctic. National weather stations do not exist in Avery, Idaho. Based on data collected at regional weather stations, the area is characterized by warm moderately moist summers and cool snowy winters. The average temperatures in the summer and winter are in the mid 60s °F and mid 20s °F, respectively. Annual average precipitation is about 20 to 24 inches, most as snowfall. Precipitation intensities are predicted to be as follows (NOAA, 2008):

- Two Day – 6 Hour precipitation event is estimated to be 1 inch
- 25 Year - 24 Hour precipitation event is estimated to be between 2.8 and 3 inches
- 100 Year – 24 Hour precipitation event is estimated to be between 3.4 and 3.8 inches

3.4 Geology and Hydrogeology

This section describes the regional geologic and hydrogeologic setting followed by Site-specific geology encountered during subsurface investigations at the Site.

3.4.1 Site Geology

The Site is along the St. Joe River in mountainous topography in northern Idaho. The Site geologic materials consist of, from the surface to depth, fill materials existing up to 18 feet thick overlying mostly sand and gravel alluvial deposits with bedrock at an unknown depth. Some colluvium deposits are suspected to exist along the toe of the mountain sides in the northern most areas of the Site although their occurrence has not been documented. The current river bank for approximately 700 feet length along the Site has been excavated and replaced with fill soils with riprap rock placed on the riverside surface for armor to minimize bank erosion.

3.4.2 Site Hydrology

The St. Joe River flows through a relatively narrow mountainous valley from east to west by the Site. The Site is within a relatively wide valley along a stretch of river that has a relatively low gradient

compared to the river upstream. The interaction between groundwater and the river is dynamic with season, antecedent rainfall and snow melt, and river levels. The flow of groundwater at the Site is revealed by the measurements of the groundwater static water levels. The groundwater pattern shifts within Section 15 and 16 Areas. At the eastern portion of the Section 15 Area of the Site, the St. Joe River water appears to enter the river bank and becomes groundwater (near MW-5, which has a higher water level than EMW-02 [see Figure 3-3 of the EPA Start-3 Report (Ecology and Environment, Inc., 2007)]. This is not uncommon in areas of mountainous streams that have a lower relative hydraulic gradient and developed floodplain.

In data reviewed, the groundwater is between 10 and 16 feet below ground surface with water levels comparable with the St. Joe River surface water. Groundwater is flowing parallel to the river within much of Section 15 Area. The groundwater flow pattern is also influenced from groundwater flowing southward from the mountainside. The Site groundwater appears to change and flow toward the southwest and toward the St. Joe River from commingling with mountainside groundwater in the middle portion of the Site (in the area around well HC-4 and around the boundary between Section 15 and 16 Areas). From the groundwater level and the river level measurements, groundwater appears to be discharging to the river within the western portion of the Section 15 Area and the eastern portion of the Section 16 Area. When operational, a private groundwater supply well (designated as DW-01 in the EPA Start-3 Report), located at the western margin of the Site, may locally influence the groundwater flow pattern and discharge to the river. The groundwater and St. Joe River level measurements would have to be conducted more frequently to determine seasonal changes in groundwater flow patterns and interactions between the groundwater and the river.

The groundwater within the Section 16 Area is derived from either direct infiltration of meteoric precipitation, from groundwater flowing from the east (Section 15 Area) or from groundwater flowing from the north (Highway 50 Area). The contributing amount of water from each source is uncertain.

4.0 SITE CONCEPTUAL MODEL AND EE/CA APPROACH

The intent of the EE/CA is to adequately understand the nature and extent of contamination at the Site and to evaluate and select the most appropriate remedy. Figure 4-1 shows the railroad station layout, facilities, roundhouse, tracks, and transfer pipelines.

4.1 Potential Sources

4.1.1 Section 16 Area

Section 16 Area includes land west of the Section 16 and Section 15 boundary of T45N R5E, except for State Highway 50 Property. Figures 2-1 and 2-2 depict the approximate boundary between Section 15 and 16 Areas. Section 16 Area included the former railroad roundhouse, maintenance shop, and other structures (see Figure 4-1). Potential petroleum releases have not been fully documented, but releases may have occurred from the maintenance shop during degreasing of engine and railroad equipment and from wash-down of railroad engines and freight cars in the roundhouse and railroad spurs. Because chlorinated solvents, volatile organics, and light petroleum hydrocarbons are not major constituents at the Site (see Section 4.3), releases from degreasing operations do not appear to be a major source within Section 16 Area. Washing engine operations in the roundhouse would have produced a heavy oil dripping-type release that would be expected to result in impacted shallow soils rather than impacts to deeper soils and groundwater impacts. The western portion of the Section 16 Area has not been investigated. Although releases of hazardous substances have not been documented or known to have occurred, uncertainty exists regarding potential sources in the western portion of Section16 Area.

4.1.2 Highway 50 Area

The Highway 50 Property extends 50 feet and 125 feet from the road's center line to the south and to the north, respectively (see Figure 2-2). The former 500,000 fuel oil tank appears to have been mainly on this property (see Figure 4-1), although a portion may have extended onto the Section 15 Area. Although releases of fuel oil and the condition of the fuel oil storage tank have not been fully documented, the Site groundwater is impacted from a diesel/heavy oil type of petroleum that would be expected to be similar to the type of fuels used for railroad engines. Fuel oil transfers between (to and from) railroad storage cars and the storage tank may also have released fuel oils to the ground. The potential for large releases of petroleum fuels, such as diesel and fuel oil, is greater from the Highway 50 Area.

4.1.3 Section 15 Area

The Section 15 Area is east of the Section 16 and Section 15 boundary of T45N R5E, except for the State Highway 50 Property. A portion of the 500,000 gallon fuel oil storage tank may have been on this property. There was a smaller oil tank nearer to the river shoreline. Numerous oil and steam pipelines were present within Section 15 Area that may have connected the large fuel oil storage tank to railroad cars and the smaller oil tank (see Figure 4-1). This area of the Site appears to be the main area where fuel oil transfers occurred, although there is no definitive documentation. The floating petroleum diesel/heavy oil petroleum product is widespread within the Section 15 Area of the Site. The potential for large releases of petroleum fuels, such as diesel and fuel oil from fuel storage tanks and transfer pipelines is also high within Section 15 Area because of the former location of fuel storage tanks and fuel transfer pipelines. Some of the contaminants in the groundwater under the Section 15 Area may have migrated onto the Section 16 Area.

4.2 Media Impacted

4.2.1 Soils

Soils have been impacted from releases at the Site. Diesel and heavy petroleum hydrocarbons are at elevated concentrations in Site soils. State of Idaho rulemaking to establish standards and procedures for risk-based corrective actions at petroleum release sites are not yet finalized. Soil concentrations for polynucleated aromatic hydrocarbons (PAHs) are above State of Idaho initial default target levels (IDTLs) (IDTLs are screening guidance levels, not promulgated standards). From the samples obtained and the analytical results, metals and volatile organic compounds, although present in soils, do not appear to be the major hazardous substances at the Site. Polychlorinated biphenyls (PCBs) were tested in soil samples, but were only detected at trace concentrations below EPA regulatory and State of Idaho levels of concern (E&E, 2007). The Section 16 land that extends about 500 feet west of the residential homes has not been sampled, although several railroad spurs and other structures existed in the past. Therefore, there is some uncertainty whether hazardous substance releases have occurred to these soils.

4.2.2 Groundwater:

Groundwater has been impacted from releases at the Site. A light non-aqueous phase liquid (LNAPL) is floating on the water table and its approximate extent is shown in Figure 4-2. The LNAPL is characterized as being a diesel and heavy oil petroleum product. The areal extent of LNAPL free product observed in monitoring wells within Sections 15 and 16 of T45N R5E are about equal. A significant thickness of floating LNAPLs have also been observed to be present in monitoring well MW-11, which is in Section 16 of T45N R5E, and is within the Highway 50 ROW (see Figure 2-2) and in monitoring well HC-4 located in Section 15 Area of the Site. The pattern of floating LNAPL presented in the EPA Start 3 Report (E & E, 2007) and the groundwater flow pattern (Figure 3-3 in E&E, 2007) from several measurements of the water table indicate the floating LNAPLs could have been released from sources in Section 15 of T45N R5E land relating to the fuel oil storage tanks (both large and small) and the fuel oil transfer pipelines. A possible exception being the thick layer of floating LNAPL in well MW-11. The floating LNAPL within well MW-11 may be associated with the large 500,000 gallon fuel oil storage tank that has migrated due west. A complete characterization/profile analysis of the floating LNAPL from well MW-11 has not been conducted for comparison with the floating LNAPL from well HC-4. Although the water table within Section 16 of T45N R5E has floating LNAPL, the thickness of the floating product appears to be generally thinner than that observed on the water table in the Section 15 Area of T45N R5E and below Highway 50 ROW Area (Figure 2-4 and Table 3-3 in E&E,2007 and Table 1 in Hart Crowser, 2000d, which could be a result of migration from groundwater flow from Section 15 of T45N R5E, rather than from sources or releases within Section 16 of T45N R5E (with the possible exception of the floating LNAPL in MW-11). The greatest historically observed LNAPL thickness in the Section 16 Area was 0.79 feet in EW-2; whereas, the maximum thickness historically observed in the Section 15 Area was 4.4 feet in HC-4, 0.95 feet in EW-3, 0.72 feet in TP-2, and 0.90 feet in EW-4 and in the Highway 50 Area was 4.15 feet in MW-11 (Figure 2-4 in E&E, 2007). The thickness of the floating product in monitoring well HC-4 appears to be decreasing when comparing observations in 2000 (Table 1 in Hart Crowser, 2000d and Figure 2-4 in the E&E, 2007) at 4.4 feet in 1998 and 1999 to the more recent observation by E&E of 0.88 feet in HC-4 (Table 3-3 in E&E, 2007).

The potential exists for constituents composing the floating LNAPL to become solubilized and impact the groundwater quality of the water table aquifer. These concerns have been expressed in the EPA Start 3 Report (E & E, 2007). Although the groundwater (water phase) from Site monitoring wells have been sampled for groundwater quality, the reported sampling procedures reviewed from the

received reports (including the EPA Start 3 Report) do not provide details sufficient to evaluate the representativeness of the groundwater samples for analysis of the dissolved constituent concentrations in the water phase. Two reasons that the groundwater samples may not represent the water phase dissolved constituent concentrations are: 1) if sampling groundwater occurred below a floating LNAPL layer, carry down of the floating LNAPL could impact the water sample; and 2) if the turbidity of the groundwater sample was elevated and not representative of local groundwater, naturally occurring metals and absorbed organic compounds (that have a high soil to water partitioning coefficient such as heavy oils and PAHs) may be present in the water sample at levels that do not represent the groundwater phase. Although the E&E report (E&E, 2007) states that the groundwater samples were obtained from wells that did not have a floating LNAPL at the time of sampling, the sampled wells exist in an area identified as having a floating LNAPL present. The turbidity of groundwater samples obtained during the E&E 2007 investigation had turbidity levels (E&E, 2008) that may not be representative of local groundwater conditions.

4.2.3 St. Joe River

A floating LNAPL continues to be observed at times to be entering the St. Joe River through seeps along limited sections of the Site shoreline. Such a LNAPL sheen has been present in the St. Joe River adjacent to portions of the Site since at least 1988. As noted, the 2000 remedial action to construct an impermeable wall along the river appeared to eliminate the sheen until 2005 (Potlatch, 2005). The floating LNAPL is similar to the floating LNAPL observed on the Site's water table. The location of the seeps containing floating LNAPL traverses both Section 16 and 15 of T45N R5E shoreline. The location of these seeps is consistent with the anticipated Site groundwater flow pattern and groundwater discharges to the St. Joe River. The discharge of dissolved constituents that are within the groundwater of the Site water table to the River has not been adequately defined in the studies received and reviewed.

4.3 Constituents of Potential Concern

Although the western portion of the site has not been investigated, the following identification of the constituents of potential concern (COPCs) is summarized based on previous investigations and the history of operations at the Site. Constituents of potential concern (COPCs) include diesel and heavy oil at the Site. The floating LNAPL is composed mainly of heavy oils that were used to fuel the locomotives at the site. Heavy fuel oils were stored at the Site in a 500,000 gallon tank with numerous transfer pipelines and secondary smaller storage tanks.

PAHs (particularly the carcinogenic PAHs) and naphthalenes may be considered secondary COPCs because they have been detected in Site media and may be associated with the heavier fractions of diesel and fuel oils. The only other semi-volatile organic compound detected above risk-based screening levels was bis (2-ethylhexyl) phthalate, which is a common laboratory contaminant. PAHs and naphthalenes are included as a COPC because they were detected in soil and floating product samples.

Because electrical transformers that potentially contained PCBs may have been stored on-Site in the past, PCBs were evaluated. Detected concentrations of PCBs have been trace in Site media. All soil samples are below Idaho risk-based screening levels. The highest PCB detected at the Site was in the floating LNAPL obtained from well HC-4 at 0.330 milligrams per kilogram (mg/kg). The only detection of PCBs in groundwater was in one well at 0.028 micrograms per liter (µg/L). Although this groundwater sample was above the Idaho risk-based screening level of 0.0279 µg/L, Federal and Idaho rules exist for PCBs at 0.5 µg/L total PCBs, which are well above any detected PCBs in Site groundwater samples. Therefore, PCBs are not considered a COPC for the Site. However, surface

soils in the western portion of the Site and floating product and groundwater not previously investigated will be tested for PCBs.

Metals may be considered a COPC at the Site, because metals were detected in both soils and groundwater at the Site. Although the concentrations of some metals in Site soils are above Federal and Idaho risk-based screening levels, the detected concentrations are low and similar to background levels in the Northwest (Washington State Department of Ecology, 1994; and URS and CH2M Hill, 2001). Therefore, metals are not considered a COPC for Site soils.

The metal concentrations in groundwater (particularly arsenic) were detected above Federal and Idaho MCLs, but these results may be questionable, because many of the groundwater samples had turbidity levels above 5 NTU (E&E, 2008). Therefore, metals are considered a Site COPC for groundwater until additional groundwater sampling and analysis can be completed to confirm concentrations previously detected.

Volatile organic compounds (VOCs) are not considered to be a COPC at the Site. Methylene chloride was detected within the floating free product LNAPL sample obtained from well HC-4 on the Section 15 Area of the Site at a concentration of 2.7 milligrams per liter (mg/L). In addition, acetone was detected in three groundwater samples at concentrations from 1.6 to 3.2 µg/L, but below federal and state of Idaho standards for groundwater or drinking water quality standards. Methylene chloride and acetone are common analytical laboratory contaminants that frequently impact samples while undergoing laboratory analysis. The only other VOC detected in groundwater was chlorobenzene at concentrations of 1.4 to 3.6 µg/L; also well below Federal and State of Idaho groundwater and drinking water quality standards. Because VOCs have not been detected in many environmental samples, and the detected VOCs in Site samples are either common laboratory contaminants or are at concentrations below regulatory levels of concern, VOCs are not considered COPCs for the Site.

Although the western portion of the site has not been investigated, the data provided in the previous investigations and the history of the Site indicate the following is a list of COPCs for the EE/CA at the Site:

- Diesel and heavy oil
- Naphthalenes
- PAHs (including carcinogenic PAHs)
- PCBs in surface soils in the western portion of the site, and in floating product and groundwater not previously tested for PCBs
- Metals in the groundwater

4.4 Physical and Chemical Characteristics of the COPCs

The physical and chemical characteristics of COPCs for the Site are not similar. The COPCs are considered persistent in the environment and most have limited mobility in the subsurface environment. The lighter fraction of COPCs, such as diesel range hydrocarbons and naphthalenes, degrade at a higher rate and are more mobile than the heavier petroleum hydrocarbon ranges. PAHs can be a constituent of heavy oils and would be expected to be present at the Site. PAHs are commonly grouped into carcinogenic PAHs (compounds that potentially can cause cancer) and noncarcinogenic PAHs. All PAHs are persistent and are practically immobile by themselves, but can become more mobile when dissolved and carried within a lighter petroleum fraction. Heavy range petroleum hydrocarbons and PAHs would not be expected to migrate in the subsurface environment,

unless they were mobilized by lighter-range petroleum hydrocarbons or were present as free phase liquid.

Metals are persistent because they are elements. Metal mobility varies and is influenced by the geochemical characteristics of the subsurface environment. Arsenic, one of the more mobile metals in many types of geochemical environments, has been detected in groundwater samples above federal and state of Idaho standards and is a potential human carcinogen. Other metals mentioned as a potential concern in Site media (Ecology and the Environment, 2007) include iron, manganese, mercury, aluminum, and lead. Many metals, such as lead, have a high absorption on most soils and typically are immobile in subsurface environments having normal pH and oxidizing conditions.

The COPCs are not considered volatile, except for high concentrations of diesel, because of the lighter hydrocarbon components present in diesel range petroleum.

4.5 Conceptual Site Exposure Model

The Site has historically been industrial, but residential land use has been occurring in more recent years. Potential exposure pathways to humans and ecological receptors exist from direct contact to Site soils, and from the direct contact and drinking St. Joe River surface water. An on-Site groundwater supply well (designated DW-01) is used as a source of drinking water. Although this well is not currently impacted from Site contamination, the future potential for impacted groundwater to migrate and impact this groundwater source needs to be evaluated. Secondary potential exposure pathways may be operative by human ingestion of aquatic organisms from the St. Joe River. Each potential exposure pathway is described in Section 4.5.1 through 4.5.5 below.

4.5.1 Private Groundwater Supply Well DW-01

Although trace amounts of potential Site constituent sources have been detected in groundwater samples from the private groundwater supply well DW-01, the concentrations are well below levels of concern. Detected analytes include (E & E, 2007) the following:

- Anthracene at 0.0026 µg/L(J qualified) (ID Risk Based is 3,130 µg/L)
- Diethyl phthalate at 0.018 µg/L (J qualified) (ID Risk-Based is 8,340 µg/L)
- Di-n butyl phthalate at 2.5 µg/L (ID Risk Based is 3,130 µg/L)
- Arsenic at 1.06 µg/L (Idaho Groundwater Standard is 50 µg/L)
- Barium at 21.1 µg/L (J qualified) (Idaho Groundwater Standard is 2,000 µg/L)
- Cobalt at 0.064 µg/L (J qualified) (ID Risk Based not determined)
- Many more common naturally occurring metals (calcium, iron, magnesium, manganese, potassium, and sodium)

Some of the trace detected compounds and metals may be attributed to background levels, sample bottle/laboratory interferences, or well construction materials. The detected phthalate compounds have not been detected in other Site soils or groundwater and do not appear to be from Site releases. The general direction of groundwater flow is toward the St. Joe River and impacted groundwater is not expected to flow to the private groundwater supply well. Because the private groundwater supply well is withdrawing groundwater from the aquifer that has impacted groundwater, the potential exists in the future for impacted groundwater to migrate and reach this well should hydrologic conditions change.

4.5.2 Site Soils

The Site has been an industrial operation for a century, but recently has had some residential use of the Site. Soil characterization has been conducted at the Site. COPCs have been detected in vadose zone soils but not at concentrations that would be associated with the LNAPL on the water table. The groundwater plume geometry with consideration of groundwater flow and antidotal evidence suggest that the 500,000 gallon fuel oil tank and associated transfer pipelines may be the source of the LNAPL plume. Soil sampling to date has not discovered conclusive sources in the vadose zone soils for the source of diesel/fuel oil LNAPL. This is understandable because the source of the floating free product may occupy a relatively small area of the vadose zone. Previous investigations did not focus efforts in the area of the 500,000 diesel/fuel oil storage tank for possible source of petroleum hydrocarbons causing the floating LNAPL on the groundwater table. The soils at or near the groundwater table have been impacted generally in the areas where the floating free product LNAPL is also present and is probably caused by fluctuations in the water table that "smear" the diesel/fuel oil within these soils and leave residual LNAPL within these soils. The potential for human and ecological receptors to be exposed to near surface soils by direct contact and incidental ingestion needs further risk evaluation.

4.5.3 Free Product on Groundwater Table

Free product as LNAPL of diesel and fuel oil still exists on the groundwater table at the Site, although at less of a thickness than years ago. The greatest thickness and quantities of free product LNAPL today, and in the past, were in areas within the Section 15 and Highway 50 Areas of the Site. LNAPL (See Section 4.2.2 of this Work Plan) may have migrated and spread along with groundwater flow path (Figure 3-3 in E&E, 2007) to impact the water table within Section 16 Area. According to the EPA Start-3 Report, the size of the floating free product LNAPL appears to have increased in aerial extent from 2000 to 2007. Because the thickness of the floating product appears to have decreased over the years (Table 1 in Hart Crowser, 2000d; and Figure 2-4 and Table3-3 in E&E, 2007) (also see Section 4.2.2 for more details), the source of petroleum hydrocarbons in the vadose zone soils that originally created the floating LNAPL may becoming depleted. The floating LNAPL on the water table is a potential risk to humans that would use impacted groundwater from the Site. Currently, there is no human use of Site-impacted groundwater.

4.5.4 Dissolved Constituents in Groundwater Table and Discharges to River

This potential has not been adequately studied or addressed. The groundwater sampling results from previous studies obtained groundwater samples with elevated turbidity (E&E, 2008). Turbid groundwater may not be representative of groundwater phase in an aquifer. Analytes such as total metals, heavy petroleum hydrocarbons, and PAHs are typically influenced by turbidity when the aquifer matrix has these compounds present. Groundwater samples having turbidity levels greater than naturally occurring in the aquifer groundwater may not provide representative samples for analyses of these analytes. This is a data gap that needs further understanding and characterization.

4.5.5 Impacts to the St. Joe River

The floating free product of diesel/fuel oil LNAPL seeping into the St. Joe River represents an impact to the river although its effect on beneficial uses is unknown. As a consequence, carcinogenic PAHs may be present in St. Joe River water at the location of floating product discharges at concentrations above acceptable levels. Concerns have been expressed that dissolved COPCs may represent a risk to the St. Joe River, but there is uncertainty on the concentrations of the dissolved COPCs that are discharging to the river.

The St. Joe River is classified as a special resource water and supports native West Slope Cutthroat Trout and listed Bull Trout. The river is also designated as a human drinking water source and is used for drinking water downstream. Mixing of surface water with the discharging groundwater would be expected to reduce dissolved COPCs to acceptable concentrations (if the levels are unacceptable in the discharging groundwater) and eliminate floating LNAPL to a non-observable sheen. The actual concentrations of dissolved constituents need more characterization.

4.6 EE/CA Approach

The goal of this EE/CA is to assess the nature and extent of the contamination at the Site and to evaluate a limited number of removal action alternatives appropriate for addressing the contamination. Contamination at the site that has impacted soil, groundwater, and surface water will be adequately understood so that removal action decisions can be made. The EE/CA will provide sufficient information on the source, nature, and extent of contamination, and human health and ecological risks presented by the Site. The EE/CA investigations will include treatability studies for information on the effectiveness, implementability, and costs of applicable removal actions. The EE/CA will result in a recommended removal action for consideration by the EPA.

The main concerns of the conceptual exposure model are to understand whether the private groundwater supply well will become impacted from migration of Site COPCs, to investigate potential releases in the western portion of Section 16 Area, and to evaluate removal actions that will prevent floating LNAPL from seeping into the St. Joe River to levels that do not impact beneficial uses. Previous removal actions for eliminating the discharge of LNAPL on the groundwater table to the St. Joe River have been attempted twice in the past. The past removal actions have not been completely successful and a sheen of the floating LNAPL is still sometimes visible on the St. Joe River. An understanding of the floating product escape mechanisms may be important to the selection of an effective removal action.

4.6.1 Data Needs for Understanding the Nature and Extent of COPCs and Evaluating Risks

Because the Site has been studied since the late 1980s, much information regarding the impacts to soil and groundwater has been obtained, except in the western portion of the Site. The available reports provides historical information on the thickness of the floating oil/diesel LNAPL. The most recent investigation has been conducted by Region X EPA through the START-3 Program (E & E, 2007). The estimated lateral extent of the floating LNAPL is depicted in Figure 4-2. Data gaps and evaluations to better understand the nature and extent of COPCs for the Avery Landing Site are as follows:

- Soil impacts in the western portion of the Site.
- Groundwater impacts in the western portion of the Site.
- The current extent and thickness of the floating LNAPL needs to be delineated using existing wells and one new well.
- The representativeness of the dissolved COPCs in the groundwater may be uncertain and needs to be better understood by sampling the existing wells and any new wells in a manner that provides representative samples for analysis of dissolved COPCs.
- The potential for the residential groundwater supply well (DW-01) to become impacted from migration of Site COPCs. Water-level monitoring of selected wells with changes in the St. Joe River will need to be conducted to understand the changes in groundwater flow patterns with various stages of the river.

- The flux of floating LNAPL and dissolved COPCs discharging to the St. Joe River needs to be estimated. The flux of groundwater and entrained COPCs that is discharging to the St. Joe River can be estimated by the groundwater hydraulic gradient and its transmissivity. The transmissivity can be estimated from pump tests in existing or new wells. Samples of the floating LNAPL discharging to the river and river water samples along the embankment will also need to be obtained.
- The quality of near shore surface water in the St. Joe River need to be understood. Surface water samples will be obtained from several locations along the near shore of the Site for COPC analyses.

4.6.2 Potential Removal Actions and Treatability Study Data Needs

The overall objective of the EE/CA is to evaluate applicable removal actions. Removal action objectives (RAOs) will be developed to correspond to appropriate subsections of 300.415(b)(2) of the National Contingency Plan (NCP). This EE/CA will focus on protection of human health and the environment considering the direct exposure to shallow soils, protection of groundwater supplies, and protection of the St. Joe River. Past remedial actions focused on eliminating the seepage of floating LNAPL to the St. Joe River. Because floating LNAPL is currently occurring at least during certain times of the year, the previous actions were not entirely successful. The prevention of floating LNAPL seeping into to the St. Joe River remains a primary objective of this EE/CA. Depending on investigation results and evaluation of Site risks, other removal action objectives may include the prevention of the residential groundwater supply well from becoming impacted by Site releases and reducing the potential human and ecological exposure to near surface soils.

Potential removal actions may include, but are not limited to, the following technologies:

- Do nothing
- Continued operation of the river capture booms and oil recovery wells
- Institutional controls
- Natural attenuation of Site impacted media
- Containment In-situ treatment
- Excavation with on-Site or off-Site disposal
- Excavation with on-site or off-Site treatment
- Capping or covering impacted soils

This EE/CA will screen potential removal actions and evaluate only a few viable and applicable removal action alternatives for the Site. The evaluation will be based on the effectiveness, implementability, and cost of the applicable removal actions.

Data gaps for the evaluation of applicable removal actions will need to be investigated through treatability studies. Of the above potential removal actions, the effectiveness, implementability, and costs will need refinement regarding Site-specific conditions for soil size separation, soil washing, and thermal desorption treatment. Treatability studies for these technologies will be conducted on bulk samples of the soils impacted with floating LNAPL. These samples will be obtained by test pits using an excavator to the groundwater table.

In-situ treatment technologies for heavy oil floating LNAPL needs a literature review to identify whether existing technologies have application for the Site COPCs and Site conditions. In addition, the failure of the previous floating LNAPL hydraulic barriers need to be better understood to evaluate whether these systems can be improved and made effective. A Treatability Study Work Plan will be prepared to obtain information required to adequately evaluate applicable removal actions for the Site.

4.6.3 EE/CA Process for the Site

The EE/CA will be conducted in accordance with the requirements established in the AOC. The EE/CA will include the Site property, including the area of known petroleum substance releases in the northeast corner of the Site. Evaluation of risks to human health and the environment will be conducted.

The overall EE/CA approach was developed to be comprehensive yet streamlined. Because the Site has been operational since the early 20th century, historical information regarding early phases of Site operations may be limited. Knowledge about the Site exists from previous investigations and the approach accounts for the information gained during those investigations. Additional investigations may be necessary depending on the investigation results and ongoing evaluations as information and data become available. Data gaps that must be filled for completing the EE/CA could be addressed in a subsequent investigation, if required.

This EE/CA Work Plan will have attached support plans that are required to conduct investigations and obtain information and data to evaluate removal actions. The support plans will be prepared after the EE/CA Work Plan is finalized and will include the following:

- Attachment A – Treatability Study Work Plan
- Attachment B - Field Sampling and Analysis Plan (FSP) will be developed and will contain the Quality Assurance Project Plan (QAPP) for this EE/CA. The QAPP will specify measures to ensure data quality and will identify the appropriate analytical methods and detection limits for the list of COPCs in anticipation of the eventual needs of the EE/CA.
- Attachment C - Health and Safety Plan (HASP) will be attached to this EE/CA Work Plan and apply to all field activities at the Site for the EE/CA.
- Attachment D - Biological Assessment (BA) Work Plan will be prepared after this Work Plan is finalized, but the BA will only address potential impacts for the EPA selected removal action.
- Attachment E – Cultural Resource Work Plan will be prepared and will obtain information on potential cultural resources at the Site. Cultural resources at the Site will be considered in the evaluation of removal actions in the EE/CA Report.

The data generated by the investigation scope of work presented in Section 5.0 will be reviewed to ensure that the EE/CA can be completed and a remedy proposed that will provide protection of human health and the environment. The data generated in the proposed EE/CA Work Plan will be complied and a decision will be make whether sufficient information has been obtained to complete the EE/CA Report. The decision will be made in consultation with EPA. The EE/CA will provide an evaluation of likely removal actions, and will propose a preferred removal action.

5.0 EE/CA SCOPE OF WORK

This section briefly describes the scope of work to be completed during the course of the field investigation activities for better understanding the nature and extent of Site COPCs and Site risks. The field investigations that are necessary for evaluation of applicable removal actions will be presented in the Treatability Study Work Plan (to be Attachment A of this document). Sampling methods and procedures required to complete these data collection activities are organized into tasks, which shall be completed during the EE/CA field investigation and are provided in the Field Sampling and Analysis Plan (to be Attachment B of this document). Media samples collected during the field investigation will be submitted to Test America Laboratories in Spokane, Washington for chemical analyses of all selected petroleum components. The analyses to be conducted for EE/CA media samples will also be presented in Attachment B.

5.1 Project Management

Golder will provide project management services throughout the project duration. Project management is key to ensuring that all elements of the scope of work are coordinated and that all project objectives are achieved as outlined in Golder's work plan tasks. Monthly progress reports will be submitted to EPA during the EE/CA.

5.2 Inspection and Review of LNAPL Existing Containment and Capture Systems

The purpose of this task is to better understand the mechanism(s) for LNAPL to be escaping the existing LNAPL containment and capture systems. Golder will obtain and review the design or as-built drawing of the LNAPL containment and capture systems. Particular attention will be given to elevations and St. Joe River stages. If specific elevation survey data are needed, elevations could be surveyed during the survey of the proposed new monitoring well.

5.3 EE/CA Field Work

This section provides a description of Golder's proposed field investigations for better understanding the nature and extent of COPCs and potential Site risks. The field investigations specific for the Treatability Study, Biological Assessment, and Cultural Resources will be addressed in their respective work plans (to be prepared as Attachment A, D, and E, respectively).

5.3.1 Additional Soil Sampling

Soil samples will be obtained in the western portion of Section 16 Area of the site (west of current residential buildings) where investigative data is absent. These soil samples will provide information on potential releases. Seven (7) locations as shown on Figure 5-1 will be sampled. The soils samples will be obtained using either a backhoe or drill rig to a depth of 10 to 12 feet. At each sampling location, a soil sample will be obtained from the surface, middle and bottom depths of the test pit or borehole. If soils are discolored, stained and appear impacted, a soil sample will be obtained representing the potentially impacted horizon as a substitute for the middle depth soil sample. The soils will be analyzed for the soil COPCs, but only the surface soil from each sampling location will be analyzed for PCBs.

5.3.2 Additional Monitoring Well Installation

The groundwater investigation will focus on the groundwater directly beneath the Site. A number of monitoring wells installed by EPA and Potlatch currently exist on the Site. During the investigation,

four additional monitoring wells (designated GA-1 through GA-4) will be installed at the Site. One well (GA-1) will be located between the St. Joe River and the existing monitoring well HC-1R, as shown on Figure 5-1. Two wells (GA-2 and GA-3) will be located near the river within the western portion of Section 16 Area of the site where investigative data is absent (see Figure 5-1). The fourth well (GA-4) will be installed hydraulically up-gradient (northeast) of the drinking water supply well (DW-01) for monitoring groundwater approaching the supply well (see Figure 5-1). These additional monitoring wells together with HC-1R monitoring well provide protective monitoring for Site COPCs in the groundwater migrating toward the residential groundwater supply well DW-01. The proposed location for GA-1 also provides information of the downgradient extent of the floating LNAPL on the groundwater table. GA-2 and GA-3 monitoring wells will provide information on potential releases in the western portion of Section 16 Area. The monitoring wells will be drilled using air-rotary drilling techniques. The monitoring well will be installed with its screen traversing the anticipated water table fluctuations. After monitoring well installations are complete, the wells will be surveyed for x, y, and z coordinates using the same datum used for the other existing Site wells.

5.3.3 Groundwater Hydraulic Gradient Investigation

To better understand the flow of groundwater at the Site, monitoring wells will be monitored for groundwater levels (elevations) changes. The St. Joe River is expected to influence the flow of Site groundwater based on antecedent infiltration and river stage. Elevation survey data for each existing monitoring well will be obtained from the EPA. The additional monitoring well GA-1 will be surveyed to the same datum as for the other Site wells. The water levels in the wells will be monitored monthly, depending on weather conditions for access.

Water levels monitoring will be compared to changes in the St. Joe River to better understand the influence various river stages have on Site groundwater flow patterns. A temporary staging station will be installed near the Site on the St. Joe River for measurements of river water levels. The up-stream bridge at Avery, Idaho may be used to establish a temporary river stage station if one does not exist in the area. The water-level data collected from the monitoring wells and the St. Joe River will be used to understand changes in groundwater flow patterns during different seasons and during changes in the stage of the river.

5.3.4 Groundwater Sampling

Two groundwater sampling events are proposed for EE/CA investigation to confirm analytical results. Each well will be inspected for the presence of a floating LNAPL and where present its thickness will be estimated. A sample of the floating LNAPL will be obtained from two monitoring wells, MW-11 and HC-4, which historically had significant thickness of the floating LNAPL. The LNAPL from these wells will be analyzed for the list of COPCs. Groundwater samples will be obtained from selected wells in Figure 5-1 and analyzed for the listed COPCs. The selected monitoring wells provide aerial coverage of the groundwater impacts and include;

- DW-01
- GA-1
- GA-2
- GA-3
- GA-4
- HC-1R

- EMW-04
- MW-11
- EW-3
- EMW-06
- EW-4
- MW-5

The groundwater samples will be obtained in a manner that will reduce entrained settleable soils particles and LNAPL carry-down. Two samples will be obtained from each well for metal analyses with one being inline filtered prior to preservation. The results will be used to evaluate whether additional wells are needed to complete the EE/CA Report. Wells will be surveyed for geodetic x,y,z coordinates and water-level elevations measured on the same day and prior to any groundwater purging or sampling.

5.3.5 Groundwater Pump Tests

Short–term slug tests will be performed on four (4) selected monitoring wells. The selection of wells for slug-testing will be based on well installation documentation, field inspections, and aerial representativeness. The need and implementability for a long-term pump test will be evaluated based on the results of the short-term slug-test.

5.3.6 Near Shore Floating LNAPL, Surface Water, and Sediment Sampling

The St. Joe River LNAPL seep, surface water and sediments will be sampled along the river embankment to assess discharges and impacts from the Site. The sampling stations are shown in Figure 5-1. Two sediment samples will be obtained at each surface water station; one at the shoreline and a second one about three or four feet from the shoreline. Only one sediment sampling event will be conducted. Two sampling events will be conducted for LNAPL (if present) and river water samples that coincide with maximum groundwater discharges to the river (high hydraulic gradient between the groundwater levels and the river water level). River station RS-1 will represent up-river background for comparison to river stations RS-2 through RS-8. The samples will be analyzed for the list of COPCs

6.0 EE/CA REPORTING

After the all field investigations (including the treatability study) are successfully completed and all laboratory data is received, Golder will begin the formal evaluation of collected data and observations. This will include the following key elements described below.

A report documenting the EE/CA investigation, as required by the AOC, will be prepared. After the fieldwork is successfully completed and laboratory data received, Golder will formally evaluate the collected data. This will include reviewing and summarizing all field activities, establishing the history and environmental setting for the Site, describing the Site geology and hydrogeology, establishing a set of contaminants of concern for each area (or sampling zone) at the Site, identifying applicable or relevant and appropriate requirements (ARARs) relative to the Site, and defining the nature and extent of on-site and off-site soil and groundwater conditions. Points of compliance for the Site will also be established. The EE/CA Report will also include appropriate fate and transport modeling as necessary to determine trans-media transfers and possible future contaminant concentrations.

The following evaluations and reporting requirements are anticipated for presenting Site investigation results to the EE/CA Report:

Evaluation

- Reviewing the field notes, borehole logs, observations, and measurements;
- Analyzing pump test data;
- Reviewing, validating, compiling, and assessing all groundwater, surface water, sediment and soil chemical data collected;
- Screening of chemistry data for the Site soils and groundwater against applicable requirements to establish a list of chemicals of concern and to evaluate human and ecological risks; and
- Evaluation of the treatability study results.

Reporting

- Provide a Technical Memorandum that summarizes the data and identifies whether sufficient data exist for completing the EE/CA. If sufficient data do not exist for completing the EE/CA, then this memorandum will include a list of proposed additional data needs (with a plan for collection and analysis). If sufficient data do exist for completing the EE/CA, then this memorandum will also include a list of proposed remedial alternatives (with a detailed description of components) to be evaluated in the final EE/CA document;
- Describe the environmental setting and current Site condition in the EE/CA Report;
- Describe Site geology and hydrogeology in the EE/CA Report;
- Delineate the soil impacts identified across the Site in the EE/CA Report;
- Assess Site groundwater quality in the EE/CA Report;
- Provide an Idaho and EPA compliant terrestrial risk evaluation in the EE/CA Report; and
- Provide an Idaho and EPA compliant human health risk evaluation in the EE/CA Report.

The EE/CA Report shall also include a brief review and consolidation of the investigation findings, identification of contaminant areas and volumes, supporting fate and transport predictions, and an establishment of appropriate RAOs for Site removal actions. Subsequently, a set of removal actions alternatives will be developed that achieve the RAOs for the Site. The removal action alternatives shall be described and rated based on their relative merits on effectiveness, implementability, and cost criteria. Cost of each removal action alternative will be estimated to an accuracy sufficient to distinguish among the removal action alternations. After this, a recommended removal action will be proposed that best meets the selection criteria for the Site.

Treatability studies are described in Attachment A for appropriate removal technologies and will be conducted on bulk samples of the soils impacted with floating LNAPL. These samples will be obtained by test pits using an excavator to the groundwater table. The results of the treatability studies will be used in the detailed evaluation of the removal action alternatives in the EE/CA Report.

The results of the removal action alternative evaluation will be presented in the EE/CA Report in the following outline:

- Identification of applicable, relevant, or appropriate requirements (ARARs)
- Development of removal action objectives (RAOs)
- Identification and screening of technologies
- Assembly and screening of removal action alternatives
- Development and description of appropriate removal action alternatives
- Detailed evaluation of removal action alternatives
- Removal action recommendation.

7.0 PROJECT SCHEDULE

Figure 7-1 is a general schedule for completing the EE/CA for the Site, which begins after approval of this EE/CA Work Plan by the EPA. Assuming the EE/CA Work Plan is approved by December 23, 2008, the support plans will be submitted during January, 2009. If the EPA review period is four weeks for the support plans, they are expected to be finalized by the during March 2009. The EE/CA investigation and treatability studies will begin during the spring of 2009 after thaw when the Site becomes accessible, and will continue through the summer and fall of 2009.

Several factors that could require the schedule to be extended include the following:

- If additional investigation is needed at the conclusion of the data gathering effort, based on the Technical Memorandum and EPA concurrence, the schedule will need to be extended to conduct the additional investigations and will depend on the scope of work for additional investigations. If sufficient data do exist for completing the EE/CA, then this memorandum will also include a list of proposed remedial alternatives (with a detailed description of components) to be evaluated in the final EE/CA document. The decisions on the adequacy of the data and the list of remedial alternatives will be made in consultation with EPA.
- If additional drafts are needed for approval by EPA.
- If EPA and other reviewing agencies (U.S. Fish & Wildlife Service, SHPO, etc.) need a longer period for review of documents.
- If EPA requires a public comment period for any of the documents before finalizing.

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FIGURES

Source: Ecology and Environment, Inc., 2007

FIGURE **1-1**
SITE LOCATION MAP
EE/CA WORK PLAN AVERY LANDING SITE/WA

Source: Ecology and Environment, Inc., 2007

FIGURE **1-2**

SITE VICINITY MAP

EE/CA WORK PLAN AVERY LANDING SITE/WA

LEGEND

Site Boundary

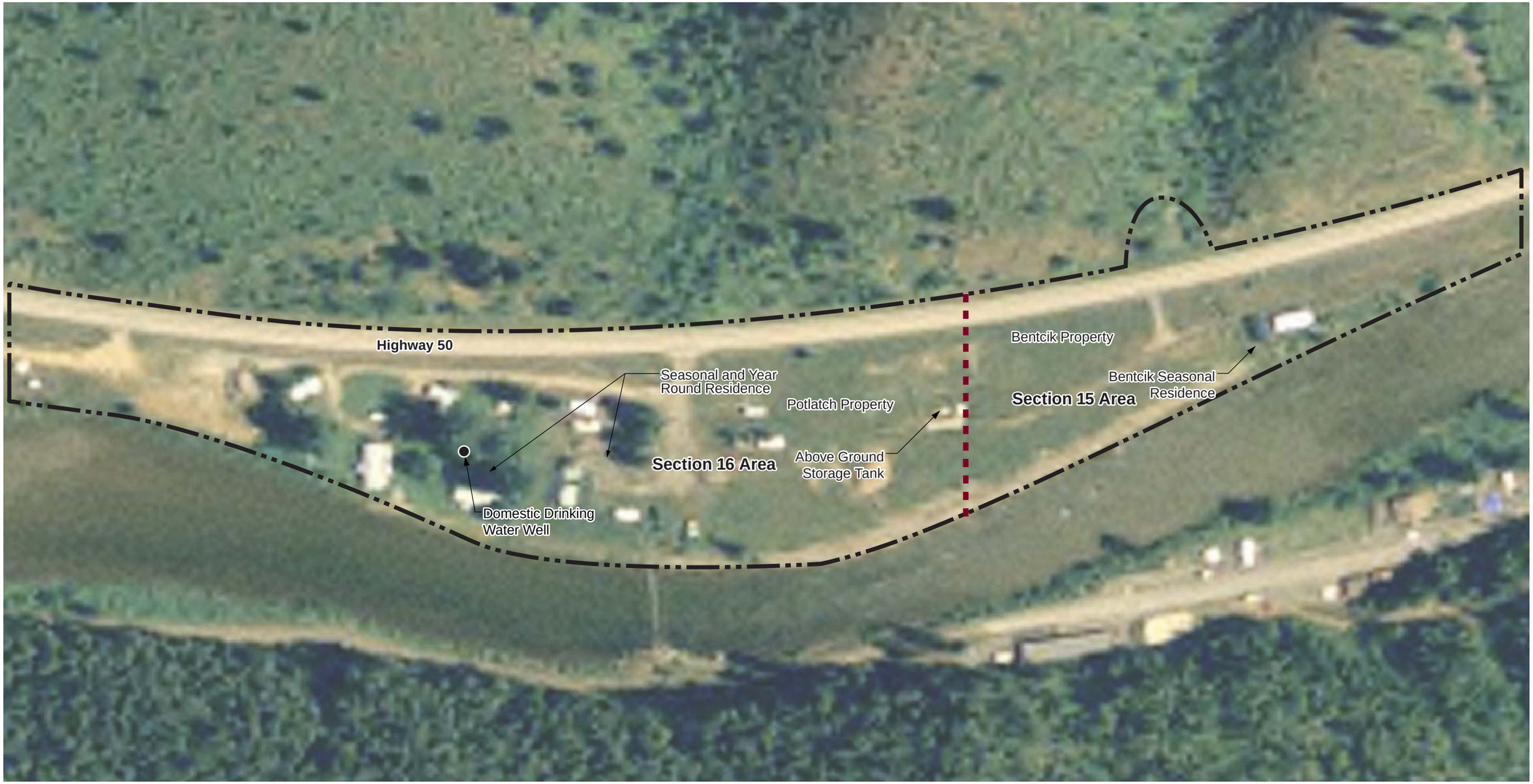
0 140

APPROXIMATE
SCALE IN FEET

FIGURE **1-3**

SITE BOUNDARY MAP

EE/CA WORK PLAN AVERY LANDING SITE/WA



LEGEND

- Property Line & Section 16-15 Division Line
- Site Boundary

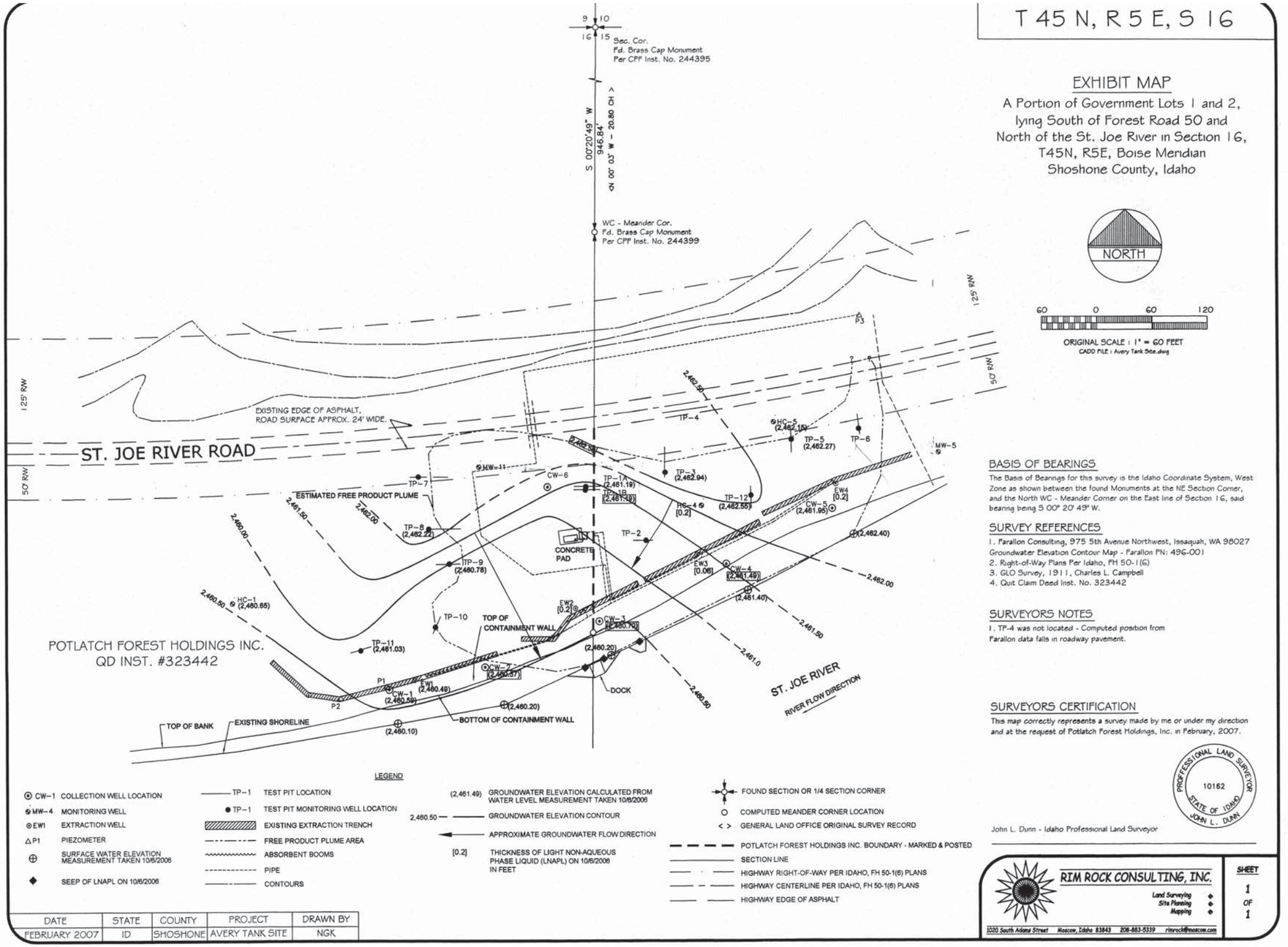
0 140

APPROXIMATE SCALE IN FEET

FIGURE **2-1**

SITE LAYOUT MAP

EE/CA WORK PLAN AVERY LANDING SITE/WA



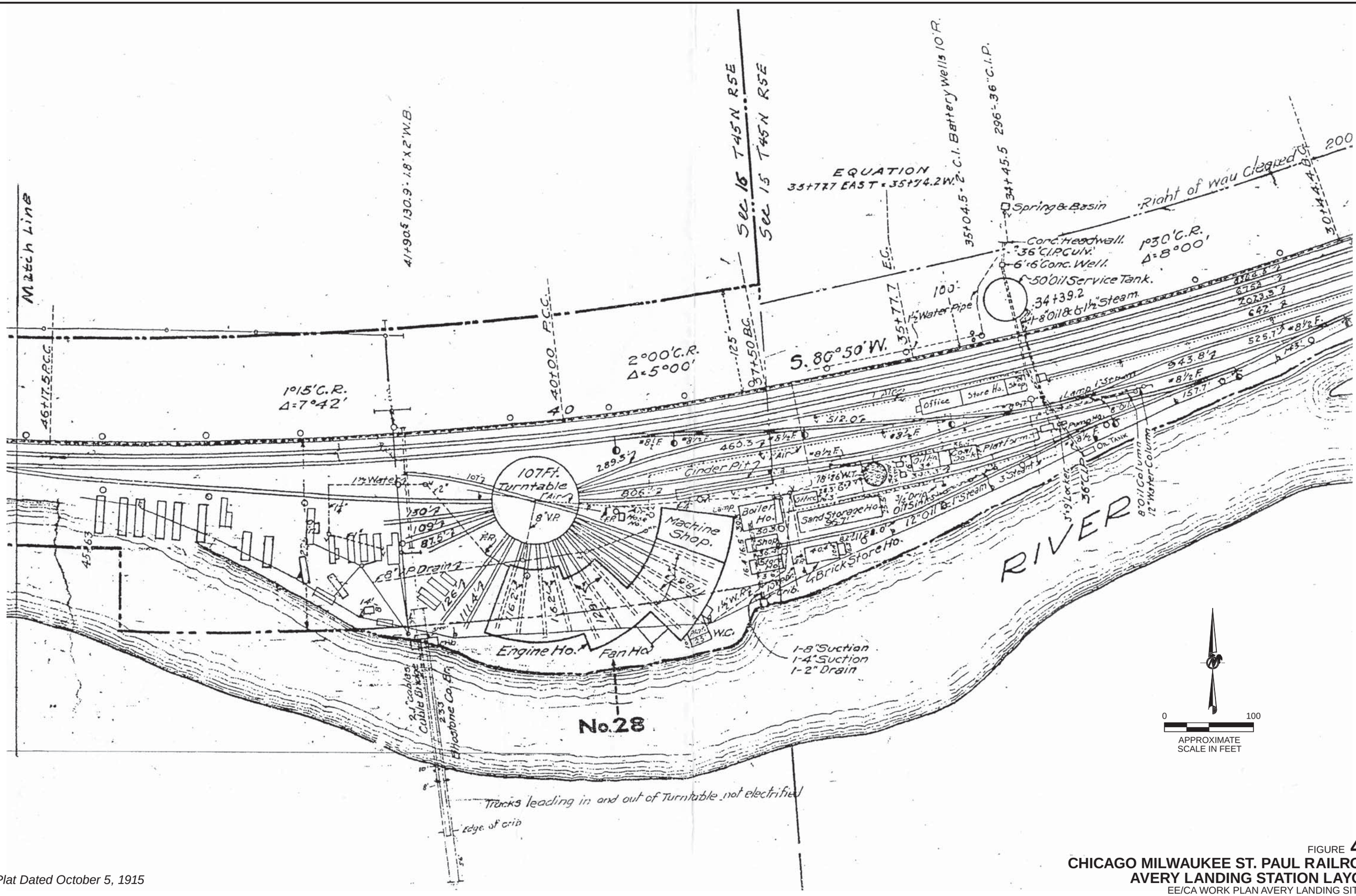
0 120

APPROXIMATE SCALE IN FEET

FIGURE **2-2**

SURVEYED PROPERTY BOUNDARIES AND HIGHWAY 50 EASEMENT

EE/CA WORK PLAN AVERY LANDING SITE/WA

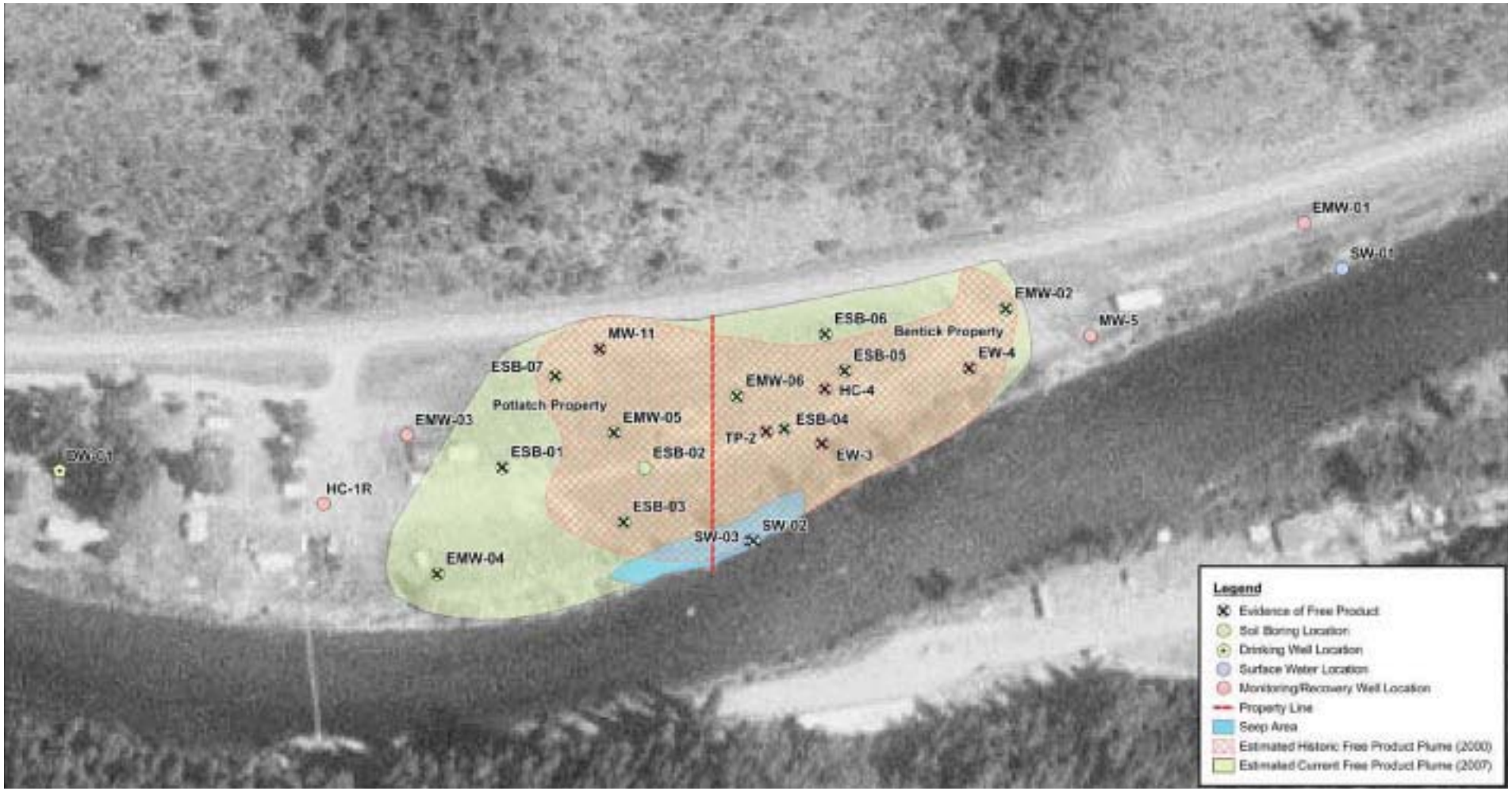


Plat Dated October 5, 1915

FIGURE **4-1**

CHICAGO MILWAUKEE ST. PAUL RAILROAD
AVERY LANDING STATION LAYOUT

EE/CA WORK PLAN AVERY LANDING SITE/WA



Source: Ecology and Environment, Inc., 2007

N

0 25 50 100 150 200
Feet

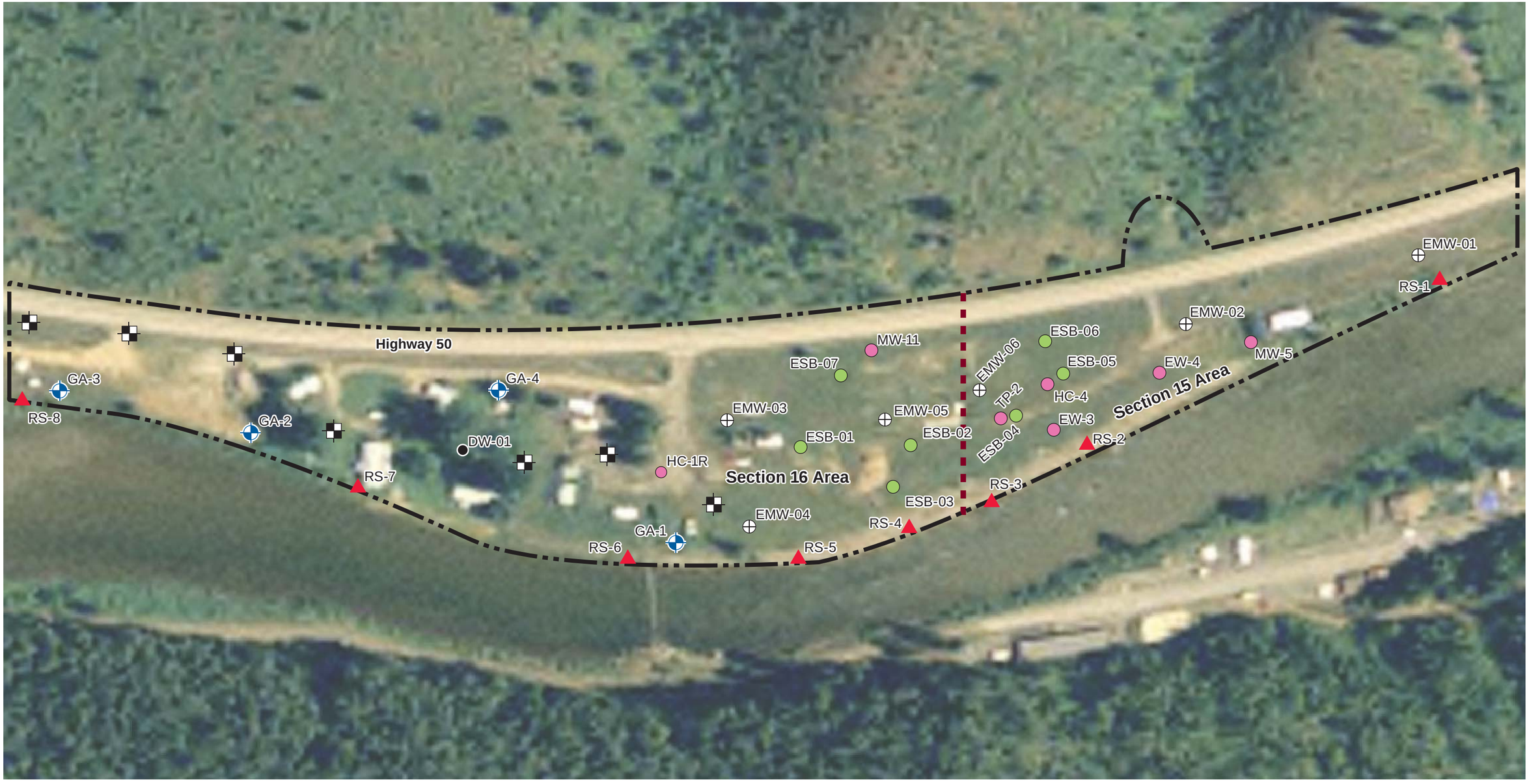
Scale 1:1,200

APPROXIMATE SCALE

FIGURE **4-2**

BORING AND MONITORING WELLS WITH OBSERVED FREE PRODUCT

EE/CA WORK PLAN AVERY LANDING SITE/WA



LEGEND

- Property Line & Section 16-15 Division Line
- Site Boundary
- EPA Monitoring Well
- EPA Soil Boring
- Monitoring Well
- Surface Water Sample Location
- Domestic Well
- Proposed EE/CA Monitoring Well
- River Sediment and Floating LNAPL and Surface Water Sampling Location
- Test Pits for Soil Sampling

0 140

APPROXIMATE SCALE IN FEET

FIGURE **5-1**

EE/CA INVESTIGATION SAMPLING LOCATIONS

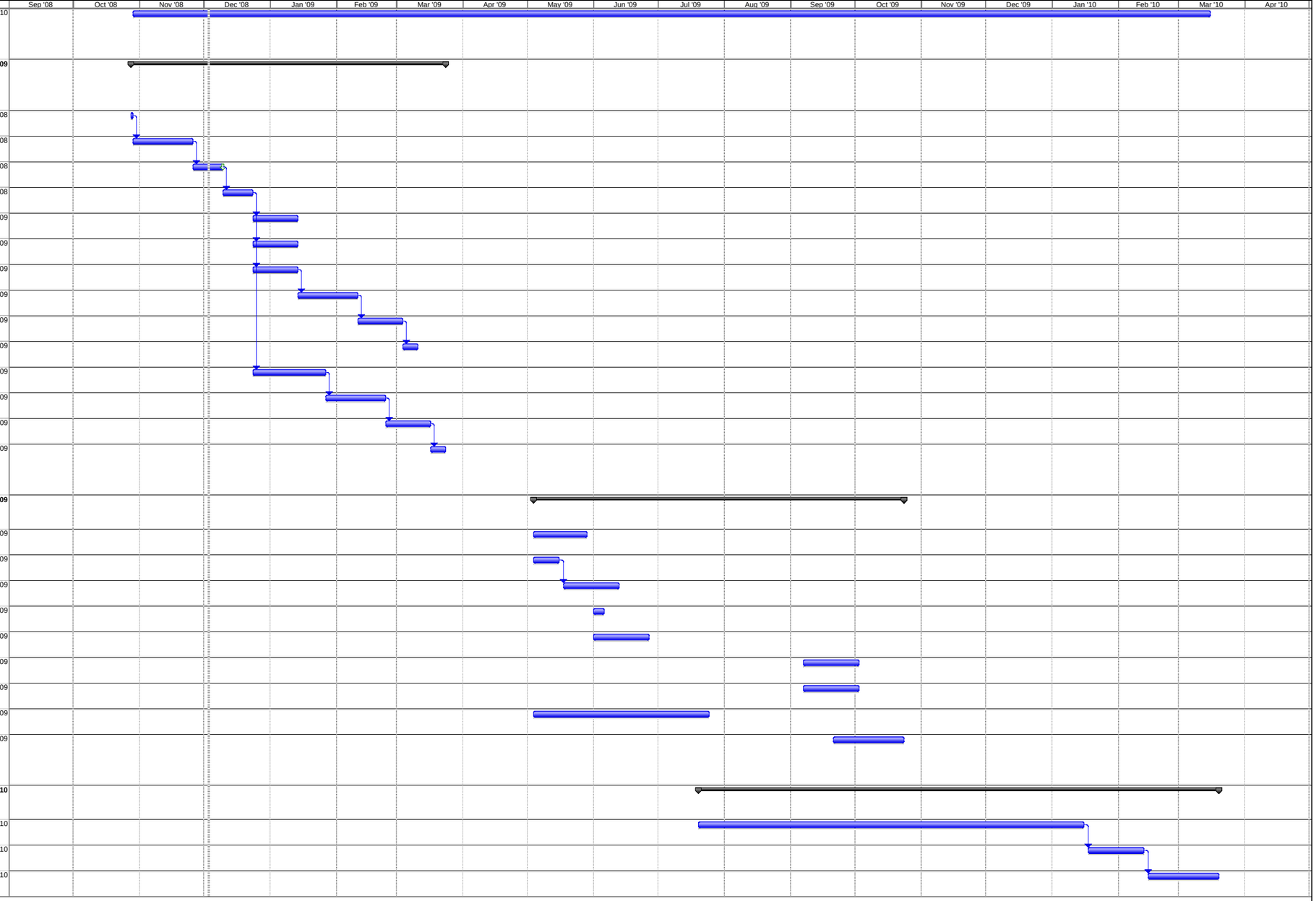
EE/CA WORK PLAN AVERY LANDING SITE/WA

0739331202fig5-1_R1.ai | Mod: 10/27/08 | AMP

Golder Associates

FIGURE 7-1. ANTICIPATED SCHEDULE FOR PROPOSED AVERY LANDING EE/CA

ID	Task Name	Duration	Start	Finish
1	**PROJECT MANAGEMENT**	360 days	Wed 10/29/08	Mon 3/15/10
2	**EE/CA WORK PLAN & SUPPORT PLANS**	**105 days**	**Tue 10/28/08**	**Mon 3/23/09**
3	Draft EE/CA Work Plan Submittal to EPA	1 day	Tue 10/28/08	Tue 10/28/08
4	EPA Review and Comments on Draft EE/CA Work Plan	20 days	Wed 10/29/08	Tue 11/25/08
5	Revision to the Draft EE/CA Work Plan	10 days	Wed 11/26/08	Tue 12/9/08
6	EPA Approval & Final EE/CA Work Plan	10 days	Wed 12/10/08	Tue 12/23/08
7	Draft Field Sampling Plan Preparation	15 days	Wed 12/24/08	Tue 1/13/09
8	Draft Cultural Resources Work Plan	15 days	Wed 12/24/08	Tue 1/13/09
9	Draft BA Work Plan	15 days	Wed 12/24/08	Tue 1/13/09
10	EPA Review of Field Sampling Plan, Cultural Resources Work Plan, and BA Work Plans	20 days	Wed 1/14/09	Tue 2/10/09
11	Revised Field Sampling Plan, Cultural Resources Work Plan, and BA Work Plans	15 days	Wed 2/11/09	Tue 3/3/09
12	EPA Approval and Final Field Sampling Plan, Cultural Resources Work Plan, and BA Work	5 days	Wed 3/4/09	Tue 3/10/09
13	Draft Treatability Study Work Plan	24 days	Wed 12/24/08	Mon 1/26/09
14	EPA Review & Comment on Draft Treatability Study Work Plan	20 days	Tue 1/27/09	Mon 2/23/09
15	Revised Draft Treatability Study Work Plan	15 days	Tue 2/24/09	Mon 3/16/09
16	EPA Approval and Final Treatability Study Work Plan	5 days	Tue 3/17/09	Mon 3/23/09
17	**EE/CA INVESTIGATIONS**	**126 days**	**Mon 5/4/09**	**Fri 10/23/09**
18	Implement Soil Sampling Task	20 days	Mon 5/4/09	Thu 5/28/09
19	Install & Survey Groundwater Monitoring Wells	10 days	Mon 5/4/09	Fri 5/15/09
20	First Groundwater Sampling and Analyses Event	20 days	Mon 5/18/09	Fri 6/12/09
21	Groundwater Hydraulic Pump Tests	5 days	Mon 6/1/09	Fri 6/5/09
22	First Surface Water & Sediment Sampling and Analyses Event	20 days	Mon 6/1/09	Fri 6/26/09
23	Second Groundwater Sampling and Analyses Event	20 days	Mon 9/7/09	Fri 10/2/09
24	Second Surface Water & Sediment Sampling and Analyses Event	20 days	Mon 9/7/09	Fri 10/2/09
25	Treatability Study & Cultural Resource Evaluation	61 days	Mon 5/4/09	Fri 7/24/09
26	Technical Memorandum to EPA	25 days	Mon 9/21/09	Fri 10/23/09
27	**EE/CA REPORTING**	**175 days**	**Mon 7/20/09**	**Fri 3/19/10**
28	Draft EE/CA Report	130 days	Mon 7/20/09	Fri 1/15/10
29	EPA Review & Comment on Draft EE/CA Report	20 days	Mon 1/18/10	Fri 2/12/10
30	EPA Approval Final EE/CA Report	25 days	Mon 2/15/10	Fri 3/19/10



ATTACHMENT A

TREATABILITY STUDY WORK PLAN

(TO BE COMPLETED)

ATTACHMENT B

FIELD SAMPLING AND ANALYSIS PROJECT PLAN (SAP)

(TO BE COMPLETED)

ATTACHMENT C

HEALTH AND SAFETY PLAN (HASP)

(TO BE COMPLETED)

ATTACHMENT D

BIOLOGICAL ASSESSMENT WORK PLAN

(TO BE COMPLETED)

ATTACHMENT E

CULTURAL RESOURCE WORK PLAN

(TO BE COMPLETED)